THE IMPACT OF DESIGN OUTSOURCING ON THE HIGH-TECH VALUE NETWORK
Minimizing the Risk of Rapid Commoditization in a Global Economy

By

Manjula Talreja
Senior Director, Internet Business Solutions Group
Worldwide High-Tech Industries
Cisco Systems, Inc.

Robbert Kuppens
IBSG Director, Internet Business Solutions Group
EMEA Manufacturing Industries
Cisco Systems, Inc.

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Commoditization, simply defined, means that a product has become unspecialized with little differentiation from other similar products on the market, except for price. Commoditization decreases the margin on the product and typically can occur when a patent has expired or competitive advantage has eroded. If appropriate care has not been taken to protect Intellectual Property (IP), the product can rapidly become commoditized, reducing the opportunity for the Original Equipment Manufacturer (OEM) to recoup their research and development investment, appreciate returns, and maintain product leadership.

The global outsourcing of product design—as well as increased digitization of information on the Internet—has created an environment of risk that could cause premature commoditization. Although this is a global phenomenon, this document addresses the issue more specifically in the Asia Pacific region, where electronics is the predominant growth driver and global electronics capital investment continues to grow.

The potential of compromising this critical asset (IP) began to surface as early as the 1980s, when the number of high-tech companies moving manufacturing operations to Southeast Asia gained momentum. Cost reduction, decreased time to market, and increased focus on designing products through technological innovation became the goal, with outsourcing the means to achieve that end.

In the past few years, however, these Southeast Asia companies have begun moving up the value chain into design and product development, encroaching on the product leadership of the Western World’s high-tech enterprises. This phenomenon, combined with increasing digitization of IP, data standardization, global Internet access, and the evolution of global outsourcing, has made information easily accessible throughout the value chain. What does this mean? Proprietary information has become even easier to access—increasing risk for companies whose core function is innovation and product design.

Recently, Manjula Talreja, senior director of Cisco’s Internet Business Solutions Group (IBSG) Worldwide High-Tech Industries, and Robbert Kuppens, Cisco’s IBSG director, EMEA (Europe, Middle East and Africa) Manufacturing Industries, met with key senior executives from prominent high-tech companies in Asia, the United States, and Europe.
The purpose was to capture the executives’ points of view and insights on this strategically important topic, with discussions centering on the following questions:

- Is the shift of manufacturing only a matter of following the lower-labor cost curve, or is a fundamental shift occurring in the perceived value obtained from the high-tech value chain? Will Asian companies become orchestrators within this new high-tech value chain?

- Should companies in high-cost labor regions of the world own or outsource manufacturing? How should enterprises decide and manage what is core and what is context to their business?

- Will the laws that protect IP in the Western World still be valid in the new global “digitized” economy? How will companies prevent losses of product leadership?

The goal of these discussions is to help Cisco® and its customers make better business-related decisions over the next one to three years and to guide the pursuit of continued market leadership in a changing global dynamic. The research paper addresses the following issues:

- New developments in the high-tech value chain.
- High-tech value chain migration from the United States and Europe to Asia.
- Managing intellectual property in a networked virtual organization (NVO).
- Strategies to minimize risk of premature commoditization.
- Next wave of innovation.

The authors believe that maintaining market leadership in a world where manufacturing and design offshore partnerships are both a necessity and a risk requires fundamental strategy shifts. Companies need to re-establish or improve core capabilities, evolve new ways of managing and collaborating with partners, and maximize the return of IP in this global environment.

High-tech leaders must adhere to these strategies in order to survive, grow, maintain leadership, and improve margins, as well as to minimize the risk of losing market share to low-cost labor regional companies in the high-tech value chain.

For the past five years, Cisco IBSG consultants have worked with hundreds of the world’s leading companies and public sector institutions, helping them become more competitive by optimizing their business and e-business strategies, improving their operations, and deploying technology more effectively.

Based on these experiences—in addition to the current and future trends IBSG has identified—Asian companies and their skills and markets will have a significant impact on the way high-tech companies operate globally as virtual enterprises.

The authors hope that, by sharing this information, companies will be able to design effective strategies that enable the integration of global partners while managing and protecting their most competitive asset—intellectual property.

If you have any questions or feedback about this research paper or require support of the Cisco IBSG, please contact Robbert Kuppers (rkuppers@cisco.com) and Manjula Talreja (mtalreja@cisco.com).

Orchestrators are organizations that mobilize the assets and capabilities of other companies to deliver value to customers through loosely coupled processes that form a networked company. Successful networked companies create value faster, and create substantially more value per employee, than their non-networked peers. The power of this strategy is the ability to optimize specialization and avoid the compromises inevitable with tightly coupled processes where unexpected change will cause major disruption in the value chain. Players within this network have greater freedom to innovate when their orchestrators focus on outcomes rather than the way the job gets done. Although few companies will ever become pure orchestrators, nearly every company can benefit from converting one or two tightly coupled processes into loosely coupled ones to be a profitable specialist in the value network of an orchestrator.

The authors would like to thank all of the interviewed executives of Ambit, ASML, Foxconn, Hewlett-Packard, Infineon, Intel, Inventec, LG Electronics, Nokia, Philips, Samsung, ST Microelectronics, and Venture.

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DEVELOPMENTS IN THE HIGH-TECH VALUE CHAIN

The High-Tech Value Network

In the competitive global environment, speeding time to market, offering better customer service, and maintaining low cost are critical factors for business success. The high-tech industry specifically is under relentless pressure to deliver innovative products; shorter cycle times; reduced costs; improved quality, and higher performance in its value chain. For the high-tech hardware industry, the value chain can be depicted as shown in Figure 1.

The trend in high-tech evolves once-rigid supply chains toward those that are lightweight, fine-grained, and agile. For example, in the era of mass customization and personalization, a unique value chain may be needed for just a single customer and a single transaction. Other value chains may serve multiple customers over long periods of time.

A typical company must manage both kinds of value chains and recognize that the challenge of continuous value chain optimization extends beyond the company’s walls to include trading partners. With the evolution of the Internet, the linkage between all players in the high-tech value chain becomes more real-time and, thus, virtually linked as one organization—from innovation to customer delivery—creating a value network instead of merely a chain. Cisco refers to this as the networked virtual organization (NVO) business model.

FIGURE 1: HIGH-TECH VALUE NETWORK AND MARKET SEGMENTS (NON EXHAUSTIVE)
To meet market requirements for low-cost production, the high-tech companies and
Electronics Manufacturing Suppliers (EMS) companies began moving manufacturing
offshore. Asia/Pacific, where labor costs are up to 10 times lower than in the United
States and Europe, quickly stood out as an attractive new emerging market for low cost
manufacturing labor. The outsourcing of components and assembly to EMS by major
high-tech companies like IBM, Hewlett-Packard (HP), Philips, Cisco, and others is an
example of a step toward the NVO business model. Examples of EMS companies are
Solectron, Flextronics, Sanmina-SCI, and Jabil. Meanwhile, Original Design Manufacturers
(ODMs) now outsource product design based on inputs for some Original Equipment
Manufacturers (OEMs).

The shift of value creation in the high-tech manufacturing value networks, combined
with the global availability of the Internet and increased standardization of online product
development (product design descriptions usable by anyone with the same off-the-shelf
tool), has created significant challenges. The increased potential of premature commoditi-

cation mandates close monitoring and management of digitized IP between partners in
the virtual high-tech value network.

To validate this hypothesis, let us first describe in more detail the evolution of high-tech
companies toward the NVO business model.

Building the Networked Virtual Organization (NVO)

A company must clearly identify its core—those functions or elements that set it apart
from competitors. These unique capabilities create the foundation upon which an NVO
can be built. Only then can the company decide what should be kept in house (core) and
what could be outsourced (context).

The top three functions that are core to a company’s success are operational excellence,
product leadership, and customer intimacy. Depending on the core of the high-tech com-
panies interviewed, each makes different choices in outsourcing to low-labor regions.

- **Operational Excellence**: Companies such as Dell and Intel view product manufacturing
  as their core and have not outsourced their manufacturing capabilities. They may, how-
  ever, have moved their own manufacturing facilities to low-cost-labor regions.

- **Product Leadership**: Cisco and HP are two companies that view innovation as their
  core and have outsourced most of their manufacturing activities.

- **Customer Intimacy**: Sony has traditionally focused on customer intimacy. Its strong
  focus on customer intimacy and understanding of consumer “care-abouts” has led it to
  enter the game business with Playstation II and outsource the design and manufactur-
  ing of that product. As a product-leadership and operational-excellence company,
  Nokia aggressively strives for direct contact with and loyalty of its customer base as its
  core, outsourcing only parts of R&D and manufacturing. Nokia’s strategy is “to
  become the dynamic orchestrator of the extended enterprise through excellent collab-
  oration with our partners.”
Geoffrey Moore, author of *Crossing the Chasm* and *Inside the Tornado: Marketing Strategies from Silicon Valley’s Cutting Edge*, states that successful companies typically focus on just one of these functions as their core. In most cases, however, the authors found that successful companies maintain leadership in two or even three of these functions as the core and, based on this leadership, decide how to outsource other elements of the value chain.

While many factors contribute to the success of the best-performing organizations, Cisco found that successful organizations have several things in common. Each has a culture and structure focused on improving the end-customer experience. Each focuses its own operations on functions where it can excel and relies on partners to take on tasks not viewed as a competitive advantage. And each standardizes its business operations, data, and information technology, allowing it to operate more efficiently—within the company, with outside partners, and, especially, with customers. Those organizations that pursued all three of these strategies in parallel are often the most effective.

Cisco, having used this three-pronged strategy long before consulting firms gave each part a variety of names, came to call it the networked virtual organization, or NVO, an approach that every organization can use. Although some companies have deployed NVO strategies more broadly than others, no organization is yet a true NVO.

As companies such as Dell, Cisco, and others have made their first steps toward adapting an NVO business model, the “old” rules by which these companies executed are no longer the same. Taking the NVO concept a step further, the authors believe that IP, as the platform for an integrated ecosystem, is an important factor in helping to achieve NVO and that reducing the risk of premature commoditization is critical to building a truly optimized NVO.

For example, in its early years Cisco manufactured most of its own products. Over time, the company has out-tasked more elements of this function as manufacturing has become more context and less core. However, Cisco considers providing technical support to its customers core, or mission-critical, because customers rely on our networking equipment to run their businesses. For example, Cisco ensures that the information on the design and manufacturing of its products is online and shared with out-tasking partners.

Most of the tools used for product innovation, design, and development have become more standardized and available commercially “off the shelf.” And, as seen in the music industry, while the usage of standardized descriptions of IP has led to enormous improvements in the value network, it has also introduced the need to carefully protect IP. For example, the intellectual property of a compact disc (CD) is the music, not the disc itself. By digitizing the music and sending it to partners in the value chain for distribution, there was no longer a need to ship physical CDs and the logistics of shipping the product became much simpler. However, digitization of music IP meant that the music could now be easily copied.

Nokia has been careful to outsource only those parts of its value chain that do not represent the company’s core business or create an environment for rapid commoditization. This is a prime example of the decisions that must be made regarding a company’s core capabilities and how to operationalize internal processes in an environment where IP is a cornerstone for survival.

As more companies migrate toward the NVO business model, the proper management of IP within the value network should be part of the operational excellence when a company wants to orchestrate the NVO for its customers. With the traditional regions of Asia Pacific becoming less cost effective, the shift of EMS functions is now moving to Northeast Asia. And as those regions that previously dominated the EMS industry move further up the value network, they will not always respect the intellectual property of other companies.

The following section of this paper discusses the shift of value creation in the high-tech value networks from the United States and Europe to other parts of Asia, specifically the northeast, and how this shift affects the dynamics of the high-tech value network.

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1. An organization can choose to work toward different NVO roles. The two most commonly-noted roles are “orchestrator” and “player.” Orchestrators play a lead role, influencing the industry structure and cultural tone to suit their strengths. Players generally assume the ultimate responsibility for the end product or service. Players are participants who perform critical-path value creation. They complete the processes out-tasked by the orchestrator.

2. For more information on NVO strategies:
In the 1960s, Japanese exports dominated U.S. and European markets, starting with consumer electronics. However in the late ’70s, as the Japanese standard of living began to rise and labor costs increased, it was no longer cost effective to manufacture in Japan for export to U.S. and European markets.

In the early 1980s, major manufacturers from Japan, the United States, and Europe began shifting manufacturing operations to Singapore, Malaysia and, to some extent, the Philippines. These manufacturers also began to compete successfully in the electronics market, especially in the consumer, computer, computer peripherals, and semiconductor industries. With its English-speaking population and well-educated workforce, the Southeast Asia region enjoyed significant business growth during the 1980s (see Figure 2).

While Southeast Asia companies, with help from their governments, endeavor to move up the value chain from manufacturing to design and innovation, increasing digitization of IP, data standardization, global Internet access, and the further breakdown of the high-tech value chain are creating an environment for rapid commoditization. This makes the need to manage and protect digitized intellectual property between partners in the virtual high-tech value chain a necessity. To validate this hypothesis, the paper first describes the high-tech trends in Asia and the country dynamics to get a better understanding of how the value creation in the high-tech value chain is shifting from the United States and Europe to nontraditional parts of Asia.

**FIGURE 2: MIGRATION OF MANUFACTURING TO SOUTHEAST ASIA**
The early 1990s saw the initial convergence of the 3Cs—computers, communications, and consumers. This convergence resulted in products that were manufactured to be compact and light, demonstrate improved performance, reduce product cost, and be conducive to outsourced manufacturing.

During this period, labor costs in Singapore became less competitive. Singapore had begun to follow the same model as Japan, in that the increase of high-tech employment resulted in a rise in the standard of living, which then resulted in high labor costs compared to emerging countries like China. In addition, due to its political instability and lack of good infrastructure, the Philippines could not sustain healthy growth and thus became less attractive for outsourced manufacturing.

Since 2000, Malaysia has also become less cost-competitive than cities on the southern coast of Mainland China. Not only is the migration of manufacturing moving to China from Southeast Asia as a result of lower labor costs, but, due to its extensive mass and population, China provides very large markets to sell into, which countries like Singapore, Malaysia, and Philippines are unable to provide.

Figure 3 demonstrates the impact of Northeast Asia on the Networked Virtual Organization within the high-tech vertical. Manufacturing is seen migrating from Southeast Asia to China with contract manufacturers in Southeast Asia migrating to the design and innovation space.

**FIGURE 3: SHIFT OF R&D IP MIGRATION TO SOUTHEAST ASIA AND MANUFACTURING TO CHINA**
Growth of Outsourced Design Manufacturers in Southeast Asia

As manufacturing grows in China and begins to take on a less significant role in Southeast Asia, the growth of ODMs using value creation to create innovation has stepped up. ODMs have been rapidly gaining share, mostly in PCs and notebooks. This is primarily due to the efforts of PC computer and consumer product manufacturers that have begun to outsource their low-end design to ODMs to reduce cost and increase efficiency. Even Sony, a consumer product company known for its product leadership and customer intimacy, has outsourced the design of its Playstation II to ASUSTek and Hon Hai.

Two concerns have arisen as a result of this ODM model. First, ODMs are selling their own branded products in the marketplace and, at the same time, reselling them under the OEM’s brand name. Second, when an OEM decides on the ODM model, its largest competitor can come in and buy a similar model, taking away brand differentiation. Both of these scenarios lead to the commoditization of the market and the rapid erosion of the margins maintained by the OEMs.

Business Models Within Asian High-Tech Companies

The continued need for manufacturers to outsource underscores the necessity of understanding how these new ODMs operate and what strategic impact they will have on an organization’s ability to manage IP. During the course of research for this paper, the authors interviewed some of the key players in the high-tech value chain, asking specific questions relative to Asia Pacific country dynamics:

- What will the future inter-country dynamics be in the hardware high-tech value chain—for example, China vs. Korea, Taiwan, and Japan?

- Is a Silicon Valley (or Valleys) of Asia emerging or have they already emerged?

- If so, does this pull away the key hotbeds of innovation from the United States and EMEA?

The expectation of the executives interviewed is that the United States and EMEA will manage the value streams for the next 10 years, but beyond that the markets may start shifting. Early signs of different local needs must be carefully and specifically addressed, including the China-specific Code Division Multiple Access (CDMA) standard for mobile communications or even different user requirements from a computer-quality level.

Kuang-Lu Lee, president of AMBIT, cautioned in our interview that companies need to make a distinction between computer and telecom markets. “In China, it is acceptable if a home computer is of reasonable quality,” says Kuang-Lu Lee. “It is not acceptable if a connection fails when calling.”

The computer market and related equipment is a commodity environment with the business rules of the commodity market, independent of country dynamics. On the other hand, players in the telecom industry will need to optimize features and pay close attention to quality and reliability. The operators in China driving new markets will focus on these specific local requirements and possibly begin orchestrating the value network, at least for their geographies.

According to Market Intelligence Center (MIC), Taiwan’s leading IT industry analyst and consulting service provider, shipments from Taiwanese handset manufacturers grew from 29 million units, or seven percent, worldwide market share in 2002 to 43 million units, or almost 10 percent of the total market in 2003.
The paper next provides a comprehensive look at how Asia Pacific will play a significant, ongoing, and evolving role in this new global dynamic.

**Asian Country Dynamics**

The traditional outsourcing of high-tech manufacturing to Southeast Asian countries is migrating north as the value chain begins to expand. Countries such as Singapore, Taiwan, and South Korea are moving up the value chain from manufacturing to design outsourcing, while China is quickly stepping up to become the most attractive new emerging market for manufacturing. This is happening for several reasons. Governments are taking measures to assist the industry in moving up the value chain by creating an environment that enables Internet access. And data standardization, increased digitization, and global Internet access have enabled more fluid market growth by making it easier for companies that identify product leadership as their core to exchange data with their value chain partners.

**Singapore**

As the standard of living and per-capita income of countries such as Singapore and Malaysia continue to increase, a shift in their competitive advantage migrates from inexpensive labor and exporting toward competition based on innovation. Singapore, in particular, has already begun to transition its expertise from low-end, high-volume manufacturing to higher-value-added, leading-edge technology production and the design and development of high-tech products.

According to HP executives Michael Hoffman, senior vice president, Asia Printers and Adrian Koch, senior vice president, Asia PCs, Singapore has traditionally been the epicenter of Asia due to comforts for ex-patriots and the relative ease of travel to most of Southeast Asia. However, with increasingly higher prices in Singapore, the migration to Northeast Asia and China has begun.

In an effort to counteract this migration and strengthen Singapore’s national competitiveness, the government has stepped up efforts to produce more value-added software technology. One effort involves the development of customized content for Singapore’s “One Network for Everyone” project, which seeks to link all three million residents to a high-speed broadband network that is 100 times faster than the Internet.

IDC, a high-tech market intelligence firm in Framingham, Massachusetts, correctly predicted that South Korea would be the third-largest Internet user by the end of 2002 with about four million people logging on—up from less than two million in 2001. Taiwan will be next with around three million, compared to just under one million now. Countries with higher per-capita income in Asia are bigger spenders on the Internet. In the case of China, with the largest Internet user population in Asia, its comparatively low per-capita income levels slow the growth of e-commerce spending.

To put this into perspective, 43 percent of global IT spending is still located in the United States with worldwide spending averaging US$913 billion, of which China is currently two percent. The same holds true for telecom with 30 percent of global telecom spending in the United States and a worldwide total of US$1.023 billion. Although China is currently five percent of this total, the number is expected to double within five years.

In Singapore, where the push is on to develop a knowledge-based economy driven by information technology and electronic commerce, manufacturers are increasingly looking to China to cut costs and gain access to a huge new market. “China will be the leading part of our Asia strategy,” says Johan A van Splunter, CEO of Philips Asia. “That’s why we moved from Singapore to Hong Kong—to be close to the driving force of the electronics industry, which will be Northeast Asia. We believe that Greater China will be the leader over time.”
Taiwan
Taiwan produces the majority of the world's notebook computers, keyboards, monitors, modems, and other categories of computer components and peripherals. In the semiconductor field, the country attained either first or second place in world share of IC design, IC foundry, IC packaging, and ROM chip sub-sectors. Recently, the service sector in Taiwan has overtaken manufacturing, increasing to more than 65 percent of Gross Domestic Product (GDP) while manufacturing has fallen to less than 30 percent. That stake is now profitably concentrated in high-tech industries while labor-intensive industries have moved on to other countries.

Taiwan has invested US$30 billion in Southeast Asia and more than 40,000 Taiwan firms have invested upwards of US$50 billion in mainland China. Taiwan Semiconductor Manufacturing Co. is looking to mainland China to expand its chip-production capacity as it shifts to 0.25- and 0.18-micron technologies, and is keeping a close eye on the Chinese government's indigenous chip program to gauge how it may affect future investments.

ODMs have been transitioning considerable capacity from Taiwan to China. This transfer has been made easier by recent softening in Taiwanese law, the close proximity of Taiwan to China, and the obvious cultural synergies. “Taiwan is well-positioned to leverage its IT capabilities and established access to global markets,” says Felix Huang, Inventec Corporation senior executive vice president. “And this potential can only grow for Taiwan, following China’s accession to the World Trade Organization (WTO). When China grows, Taiwan grows even more.”

South Korea
In terms of Gross Net Income (GNI) per capita from 1970 to 2002, Korea’s GNI was approximately US$20,000, comparable to Japan in 1985. China’s GNI was US$3,000, which amounts to the level of Korea 15 years ago. Compared with other advanced economies in the world, Korea, following the same curve as Japan, now stands at a crossroads, ready to catch up with them. In order to move forward in the world economy, Korea is adopting new strategies and the export of IP has dramatically increased over the past three years.

“The safeguarding of our intellectual property is one of our main challenges,” says Ki Youl Huh, Samsung executive vice president and chief knowledge officer. Many companies protect IP in China and other countries by owning the plants for manufacturing. All of Samsung’s key inventions are well-protected by patents and it is believed that China in general will respect patents. However, the expectation is that CDs, DVDs, and software will continue to be copied.

The Korean industry has the opportunity to use its current assets to earn a leading position in the knowledge economy. Leading companies such as Samsung and LG Electronics have not only emerged as powerhouses of South Korea, but have also gained large markets in the rest of Asia, including China. And the drive of the government to have broadband available to all households in Korea supports the absorption of new technologies, serving as a catalyst for innovation.
China

In the past five years, southern China has established itself as a high-tech center and prime location for manufacturing. However, in the past two years, due to increasing labor and shipping costs, companies have begun to look beyond southern China and toward the northern part of China, including Shanghai, Suzhou, Wuxi, Hangzhou, and other nearby regions.

The low cost of labor, a well-educated population, and an infrastructure that is fast becoming conducive to electronics manufacturing continue to make China increasingly attractive. As Johan van Splunter, CEO of Philips Asia, notes, “Compare the 700,000 electronics engineers graduating from China universities with the 1300 in the Netherlands and it is obvious the forces are shifting.” To further the appeal of doing business with China, the Chinese government is removing its requirement that the country’s foreign chip fabricators and assembly plants “export” most of their output. This will vastly improve the supply chain in China by allowing OEMs immediate access to locally-produced chips.

China will also remove its requirement that the country’s foreign chip fabs and assembly plants “export” most of their output, forcing companies to export devices to Hong Kong and then ship them back into China simply to meet the disputed export criteria. The relaxation of that rule could vastly improve the supply chain in China by allowing OEMs immediate access to locally-produced chips.

Now that China has joined the WTO, the country must continue to increase its adherence to global standards safeguarding intellectual property. Although U.S. industry associations charge that, despite a bilateral treaty with the United States for IP protection, China still has a spotty record against software and design piracy, and foreign countries can resort to stronger counteractive moves under the WTO if Chinese IP piracy isn’t curbed. (While the authors acknowledge the issue of IP piracy, this paper instead focuses on how IP becomes available through normal company interactions and how that leads to premature commoditization.)

The migration of manufacturing to China is accelerating at a rapid pace, the market has a huge propensity to absorb, and the role of Chinese government on the high-tech industry is more significant than any other country in the past. These factors create increased complexities for global companies as former areas for outsourcing—such as Singapore, Korea, and Taiwan—shift to innovation. This shift toward innovation now brings us to a critical juncture, as managing and protecting IP in this new, evolving value chain becomes an absolute necessity.

This paper next describes the risks inherent in global outsourcing and digitization that make premature commoditization a grim reality.
IP is considered a distinct competitive advantage for companies whose core is product leadership. It is the element of their business that enables them to achieve growth in revenue and margins and enjoy dominance in the value chain. These companies invest 10 to 15 percent or more of their revenue on research and development to innovate products, achieving returns on these investments by charging higher prices on branded products until competition enters the market and the product becomes commoditized.

Because product-leading companies generally try to expand this period of time before white goods compete with their products, intellectual property retention is critical to their success as orchestrators of the NVO.

The authors’ research, backed up by executive interviews, validates their belief that three primary reasons exist that put intellectual property at risk:

- Design outsourcing in the new global “digitized” economy.
- Patent laws not being followed by emerging countries.
- Emerging markets being less sensitive to brand consciousness.

**Implications and Risks of Design Outsourcing**

In the 1970s and 1980s, data and design systems were proprietary, making the pervasive accessibility of company information beyond the enterprise less of a risk when companies outsourced manufacturing. Today, with data standardization and global Internet access, proprietary information has become much more accessible. A value chain that has expanded to Southeast Asian countries, especially those being helped by their governments to move up the value chain to innovation, further complicates this challenge.

Enterprises—specifically those that consider product leadership as their core—have begun to recognize design outsourcing as a significant source of premature commoditization and are looking at outsourcing in a new light as a result of these rapidly changing dynamics.

For example, design outsourcing is driving the components of the PC and server motherboard to commoditization much faster than ever before, eroding the profits of semiconductor and components companies that spend large percentages of their revenue on R&D. In the past, when design wins were achieved for PC subsystems, the subsystems manufacturers and the large PC manufacturer worked together in tight collaboration with proprietary systems to develop the next generation product, carefully protecting IP.

With the advent of design outsourcing, global Contract Manufacturers (CMs) and ODMs are now also part of the virtual organization to enable the design win.

**Root Cause of Premature Commoditization**

This level of program management led by multiple players creates complexities and open standardized systems that can lay the foundation for premature commoditization during the design win and design in process. This may be the result of immature program management that omits the tracking of WTO rules at the component level. Or it may be that brand differentiation at the component level is no longer a major factor and Southeast Asian companies can aggressively innovate and grab parts of the motherboard.
Whatever the reason, in this complex breakdown of the value chain, profits of the component manufacturers are eroding faster than in the past and their high R&D investments no longer reap the margins they once did.

**Emerging Countries as Manufacturers**

Will the laws that protect IP in the Western World still be valid in the new global “digitized” economy?

In the 1950s and 1960s, Japan’s business model focused on duplicating and commoditizing products created by companies in the Western World. As Japan’s standard of living increased, the country began moving up the value chain into product design and innovation soon became core for its companies. As innovation became core, the risk of losing intellectual property hit closer to home, and adherence to the Western World's patent laws took on greater importance.

Korea did the same in the 1980s and today only the smaller players go to the edge of copying IP. China seems to be adapting that same strategy. The question must then be asked, “Will China follow the same model?” As research shows, there seems to be a direct correlation between a country’s standard of living and its adherence to patent law.

“WTO is starting to have a positive impact on China to respect IP, although only for large, visible enterprises, not the smaller ones,” says Fang-Ming Lu, vice president and general manager at Foxconn. “As countries and companies grow in revenue and prestige, they begin to follow the patent laws because it is in their best interest to abide by these laws as innovation grows in those nations. While the Western World’s patent rules will not change, evolving companies and countries will mature to adhere to them.” HP, Philips, Ambit, and most of the other executives interviewed echoed the same message.

As companies in developing countries enter the high-tech value chain, products are duplicated and commoditization occurs before the country moves to innovation itself and begins to follow the patent laws. The emergence from underdeveloped countries entering the high-tech value chain must be considered as a constant and, therefore, IP retention by product leadership companies will need to be closely managed in this evolving dynamic.

As noted earlier, premature commoditization is a global phenomenon. The authors have chosen to address the issue more specifically in the emerging Asia Pacific region because it is there that the low cost labor curve is more visible in the high tech value network.

**Emerging Asian Market**

In new markets such as China, customers value and demand system reliability, lower price, and better service ahead of brand recognition, while in the economically advanced Western World, brand plays an important role in choosing one product over another.

(For example, how many U.S. consumers purchase a PC because of the “Intel® Inside”?) However, in new markets, consumers care more about system reliability than they do about brand. Local companies are growing their revenues at a rapid rate in the emerging markets, challenging the branded product leadership companies of the Western World.
STRATEGIES TO MINIMIZE RISK

So, how should the high-tech companies’ business strategy evolve to become orchestrators of the NVO? Cisco IBSG has defined the following strategies that should be addressed concurrently by companies to help them lay the foundation for successfully doing business in a constantly changing global economy. These strategies include outsourcing in today’s digitized economy, speed of innovation, creating strategic alliances, the role of governments, and minimizing risk through the use of tools and Internet capabilities.

The Outsourcing Strategy
Each organization must take a close look at its core business, industry, and market to determine the most effective outsourcing strategy. Options may include:

1. **Do not outsource at all.** LG Electronics and Samsung of Korea retain their IP by not outsourcing their design or their manufacturing. “Protecting the IP in emerging countries is controlled by owning the plants for manufacturing,” says Ki Youl Huh, executive vice president, Samsung Electronics. Most companies whose core is operational excellence do not outsource manufacturing, but do increase cost efficiencies by moving their own plants to low-cost regions. LG Electronics and Samsung followed that model and, as they move into product leadership as their second core capability, they continue to keep manufacturing in-house to protect their IP.

2. **Build a hybrid outsourcing model.** Nokia has created a mature networked virtual organization with a hybrid outsourcing model and makes outsourcing decisions very carefully. The company identifies Product Leadership and Operational Excellence as its core and is striving to achieve leadership in Customer Intimacy. “Parts of the mobile phone’s engine are outsourced, but we will never outsource all of it,” says Juha T. Raisanen, Senior Vice President of Nokia. “On top of the engine, Nokia does customization of our mobile devices. We will never outsource the way the product variance occurs.” This enables Nokia to tightly manage to the cost efficiencies of the NVO and protect its IP.

3. **Choose a limited number of partners carefully and outsource all manufacturing and some parts of design.** “It will be very hard to retain intellectual property,” says Michael Hoffman, senior vice president, HP Asia. “OEMs need to very carefully select partners, maintaining a high level of control. HP closely manages the value chain and strengthens it with ODM partners.” Additionally, OEMs should use an ODM if the solution is fast, easy, and low in cost. If an EMS company could provide the engineering services on a product-by-product basis, the benefit would be substantial because the OEM would “own” the designed product, while the EMS provider would maintain the skill base and increase revenue stream.”

Increase Speed of Innovation
How fast you can deliver is more critical now than in the entire past decade. The rate of innovation must continue to accelerate to keep the competitive advantage in product leadership. A common message from all the companies, specifically HP, Nokia, and ST Microelectronics, was that if a company is based on IP, nothing substitutes continuous innovation. “By spending US$1 billion in annual printer R&D, HP is betting it can prevent its printers from becoming commodities. HP is uncorking 100 new printer products this fall…”—*Business Week*, July 14, 2003.

In addition to large investments in R&D, Internet-based solutions for product lifecycle management have already started to build propensity with CXOs, optimizing R&D investments, and increasing collaboration to develop networked virtual organizations. Product life-cycle management systems increase efficiency in the management of products, processes, and services from initial concept through design, launch, production and use, to final disposal.

Create Strategic Alliances with Nontraditional Partners
High-tech companies are creating or expanding strategic alliance departments to manage relationships with business partners where the exchange of intellectual property is required as part of a successful alliance. Traditionally, alliances were forged between two large Western World companies. Today, a critical question that must be answered as NVO business strategies are built is whether leading companies should partner or compete with the emerging country’s indigenous companies.
A positive example of using IP management and protection in a nontraditional partnership is the alliance of Philips Electronics with LG Electronics for the manufacturing and distribution of flat-panel displays. Philips was unable to manufacture cost-effective flat-panel displays, but had the IP, while LG Electronics had the low-cost production knowledge as well as low-cost labor. Philips invested US$1.6 billion to set up the joint venture of Philips LG (www.lgphilips-displays.com) and, as of May 2003, the LG Philips venture is the number-one player in flat-panel display market worldwide.

Some of our interviewees expressed concern about the negative effects of “giving away” intellectual property to competitors. This is a likely scenario when a company has been unable to capitalize on the IP it has developed and is in survival mode. Is that a threat or is choosing to partner, rather than choosing to compete, a prudent strategy that enables companies to win as emerging Asian companies start changing the playing field? Company strategies must evaluate competitors carefully in this new light and make the decision whether to partner or compete.

**Take Advantage of the Role of Government Affairs**

Government intervention is increasing in the global economy, both in terms of entering new markets and manufacturing and building plants in emerging countries following the labor curve. Because of this, companies are taking varying approaches to help ensure IP property is protected in each country where they have a presence. For example:

- In the United States and EMEA, well-developed tools exist to work with customs as well as the legal system. For this reason, local upcoming companies in Asia clone and violate IP for local markets, rather than export to the Western countries. “We rigorously register and defend our IP in 30 odd countries vs. in the past, just in EMEA and the United States,” says Pradeep Jotwani, senior vice president, Supplies IPG, HP.

- Intel, HP, and Philips all agreed that influencing, lobbying, and educating China’s government—that country’s largest consumer of exported goods—is a very critical role being played by global enterprises. “Building close partnerships with the government and education is a huge element of our marketing and sales strategy,” states Dan Russell, vice president of sales, Intel Corporation.

- “HP is generating awareness with legislators,” Jotwani says. “They are becoming aware of patent infringements and we position it with value within their country, saying that we are a big employer in the country, so this is the cost of doing business.”

For businesses such as music and other easy-to-copy digital products, Philips and many other companies think that some emerging markets will not follow the laws of the West. However, for high-tech hardware products where there is a higher cost of entry to reproduce, China will adhere. “The agreement with the Chinese government over DVD player royalties has been the first real breakthrough showing that there’s an understanding of IP in China,” says Johan A van Splunter, Philips Electronics chief executive officer, Asia Pacific. “For every DVD player, approximately US$5.00 is paid in royalties to Philips.”
Minimize Intellectual Property Risk Through Tools and Internet Capabilities

Using tools and Internet capabilities has been a critical success factor in the building of robust supply chains, workforce optimization, and customer intimacy models for leading companies such as Cisco, HP, and Intel. Cisco IBSG believes that standardized tools and processes will continue to play an important role in building an optimized NVO. However, before a discussion of the emergence of tools in the protection of IP, this paper presents a position on the role of process automation and robotics on the manufacturing floor of high-tech companies.

Robotics on the Manufacturing Floor

Many industries will continue to follow the labor curve, but Cisco IBSG questions that strategy for high-tech. Today the flexibility of automating labor processes by robotics is limited and costs are very high, therefore manufacturing continues to follow the labor curve in the global economy. Over time, however, we believe that robotics will reach maturity, its functionality may become as good as human controls, and its costs will become affordable as it reaches commoditization (even robots building robots as a scaling mechanism).

There is a possibility that the role of labor as part of the value chain will diminish for certain high-tech products. For example, in many cases only one or two percent of a product will still involve human labor support, often for the sole purpose of alleviating consumer mistrust of robotics quality. The consequence will be that manufacturing may come full circle, returning to in-house production and closer to the point of sale wherever the markets may be the largest. Outsourcing may no longer play a role both in the NVO model and protection of IP. As you develop NVO strategies in your company, keep that in mind as your business model evolves.

Tools and Internet Capabilities Today

While information technology tools to protect IP are emerging, they are not yet optimized. Following are a few existing possibilities:

Technology Escrow:
The first step toward IP protection is filing your IP and communicating it as being intellectual property. If you do not take that step, protection of your IP becomes almost impossible. Most IP protection services specializing in technology escrow and services strengthen your traditional methods of IP protection. For example, DSI Technology Escrow Services, a subsidiary of Iron Mountain, has an Intellectual Property Development Protection Agreement (IPDPA) that helps safeguard technology ownership and enhances existing legal protection under copyright, patent, and trade secret laws. An IPDPA provides evidence of when and how a technology was developed and can significantly strengthen a company’s position in any legal dispute concerning intellectual property rights. When DSI, acting as an independent third party, is used to administrate the documentation of the development of a company’s technology, others who claim to have created it first will find it difficult to substantiate their case.
Controlled Access:
You can control access to IP by allowing only your outsourcing partners and others in your value network to have access to only those parts of the required information that enable them to fulfill their part of the value network. NICE, a company based in Italy, provides an example of software in a product life-cycle management environment, making it possible to supply outsourcing partners with the right amount of detail to execute the outsourcing part of the process. Because the environment acts like a black box, the outsourcing partner is able to use only that information it is authorized to use to execute its part of the process. NICE’s Enginframe product claims to give limited and controllable access to remote users and improve collaboration with partners while protecting infrastructure and intellectual property.

Autotest Capability:
One of Cisco’s primary manufacturing competitive advantages is its autotesting capability. Autotest frees engineers from mundane, repetitive work but, just as important, it enables Cisco to validate the quality of assets produced in the facilities of the outsourcing partner. Cisco’s autotest process captures all test data, controlling the testing and material movement. Autotest determines what hardware is needed from the enterprise resource planning (ERP) order, including how much memory exists, which printed circuit boards should be in the system, what software it should have, etc. It verifies that the hardware configuration is correct and downloads the software image that the system should include. Autotest prevents a product from moving to the next step in the process until it has passed the current step.

Test, repair, and other analysis data from autotest is fed into Cisco’s Manufacturing end-to-end reporting system so that Cisco managers can track the process of manufacturing as if it were still owned by Cisco itself. That way, Cisco can also determine, remotely if required, which products are Cisco controlled manufactured and which are not. If a similar product or even software on a copy-product would be located, Cisco would be able to verify parts in the product of unique Cisco features, thus potentially disclosing the opportunity for premature commoditization. Autotest is comparable to controlled access, as it is a black box for the EMS and ODMs for quality control.

However, auto test is not the complete answer to protecting IP during the design process. Optimized checks and balances in the new business models and information systems’ prudent security methodologies must continue to evolve and mature to retain IP for companies that spend a large percentage of their revenue on R&D and focus on product leadership as their core. Creating an extranet to exchange critical information with nontraditional partners requires security that goes beyond applications and policies, but embeds security at the very foundation of your network.

Track and Trace Software:
As described earlier, processes and tools, such as technology escrow and controlled access, can manage IP protection. However, they tend to be more reactive or passive methodologies when there is IP infringement rather than proactive tracking. Track and trace software is among the emerging solutions that help identify when copyrights and other IP have been compromised and help track down the offender. Identifying who is authorized to use IP in the system and where IP is located is a major next step toward decreasing the risk of IP loss due to immature program management. In the future, the authors expect products to have digital signatures, possibly by using Radio Frequency Identification (RFID), comparable tagging for physical parts, and software encryption in high-tech products. This is already becoming the standard with companies like Zend in the software industry, whose product is used in most Web-environments. Zend’s product is the first electronic licensing solution for the PHP3 (communication protocol) marketplace combined with the encoding solution to pioneer PHP IP protection. Zend claims that its SafeGuard suite enables software vendors to maximize profitability with intellectual property protection and software license management.

Assuming companies can protect their IP, either passively or proactively, the requirement to innovate to maintain product leadership remains true. The authors next asked the executives which innovations they expected to drive their companies’ operations, where these innovations will be manufactured, where they will be absorbed in large numbers, and how this will influence the high-tech value network.

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3 PHP (recursive acronym for PHP: Hypertext Preprocessor) PHP offers a simple and universal solution for easy-to-program dynamic Web pages. PHP is today’s fastest-growing technology for dynamic Web pages. According to the authoritative Netcraft survey of what technology is actually in use on the Web, PHP can now be found on more than six million domains, and is growing at a rate of up to 15 percent each month.
As articulated in the previous section, the authors believe that the combination of standardized digitization of innovation, design, and development in the high-tech value network has led to a new challenge for companies moving toward the next stage(s) of NVO, either as an orchestrator or as a player. Because product leadership/innovation is one of the three core elements of being a successful NVO, the authors asked interviewees their vision on the next wave of innovation in high-tech.

In addition, the authors asked whether interviewees consider product leadership/innovation as core for their business or would consider changing their position based on the possibility that certain product areas are impossible to protect. For example, Philips stepped out of the music business when it became clear that the IP of music was too easy to copy and reproduce by non-traceable low-cost production areas.

None of the interviewees plan to change their current core businesses relative to product leadership. They still trust that IP will be respected in the long run. However, a common thread that arose throughout the interviews identified the pace of regional adoption of emerging technologies as the driving force that will determine the role of regional and global companies as orchestrators in that technology. In other words, being close to your customer base helps you to understand the local needs and deliver locally what is needed, scaling globally where possible. This requires U.S. and Europe-based high-tech companies to think locally and act globally from a different base than they are used to.

As described earlier, the push for broadband and other technologies that advance the connectivity of the citizens in a nation is seen as a vital ingredient to survive, because it facilitates fast communication with customers and drives the innovation absorption of new high-tech products, in general.

Many high-tech companies still have the primary base of innovation close to headquarters. The challenge is to understand potential new innovations on the other side of the globe and to bring the right products to local markets at the right time. This becomes increasingly difficult as the lifecycle of high-tech products rapidly shortens. For this reason, the authors asked the interviewed executives to identify the dominant innovations they expect to see in the next two years, where these innovations will emerge, and where they will be produced and used in mass volume.

The predominant innovations identified were:
- Mobility and wireless.
- Home networking and convergence of multiple information streams and media.
- Ambient technologies that make technology easy to use, and people’s lives easier and more convenient.

These examples reflect a common theme of “mass customized” high-tech products designed around mobility and ease of use for the end consumer. Most of our interviewed executives expect Japan, as well as areas in Asia and Europe, to lead in the absorption of these technologies. This mass customization to local and personalized needs in each region will distinguish the leaders from the followers in the high-tech industry.

Another common theme in our interviews maintained that certain applications vital for product leadership in China might not work in the United States or Europe and vice versa. This view reinforces the executives’ general agreement that providing a local presence of innovation centers (R&D) is vital to the ability to address local needs. An example is China’s development of a specific CDMA mobile network for the Chinese market that meets local standards and protocols and addresses local culture and safety rules. For that reason companies need to have local partners that can translate the customization needs in each region. With customization becoming more and more driven by software features working on hardware products, the need for protection of IP becomes ever more important.

The global high-tech value chain is here today and strategies must be developed to manage the challenges of that environment now. However, this is only the beginning and shouldn’t represent the last word in the evolution of change. In fact, manufacturing may be ready to come full circle with the next level of automation acting as a bridge, bringing manufacturing back to the Western Hemisphere through the next generation of robotics.

This new generation of robotics might offer a tool that is as pliable as human hands and closely duplicates human labor with its intricacies, decision-making powers, and flexibility. The production of these low-cost manufacturing robots could be a step closer than you might think. Who would have thought 15 years ago that milking cows would someday be fully automated? How long will it take before 95 percent of high-tech products will be produced and assembled automatically, more cost effectively, and with higher quality compared with human labor support?

The point is to develop an organization now that enables companies to quickly take advantage of their future operational power to capitalize on the next trend on the horizon.
The authors believe that the NVO is the emerging business model of the coming decade, in which customer requirements are shared among a network of nontraditional business partners. In this network, the orchestrator of the value chain will maintain focus on its own core functions and outsource less critical functions to partners. This is happening in the high-tech industry with Asia at the center as much if not more than in any other industry.

The shift of manufacturing to nontraditional partners in the expanding global economy is not simply a matter of following the lower-labor-cost curve. As Taiwan, Singapore, and South Korea—traditionally outsourced manufacturing centers for U.S. and European companies—have become less cost-effective in recent years, they have begun to move up the value chain, migrating toward design and innovation. At the same time, China is quickly stepping up to become the most attractive region for manufacturing.

This creates a new dynamic for organizations that for years have depended upon outsourcing in the traditional value chain to reduce manufacturing costs. Data standardization, increased digitization of IP, and global Internet has increased the challenges of maintaining IP. Critical decisions must now be made whether to partner or compete with these new, nontraditional partners.

Protecting a company’s most valuable asset—its intellectual property—becomes more crucial than ever before. Company leaders must weigh various factors as their business strategy evolves and ask themselves whether manufacturing and design outsourcing should be done completely in house, via a hybrid model, or by choosing limited partners. Overlooking that step could mean that the evolving high-tech players in Taiwan, South Korea, and Singapore could become the new orchestrators of the high-tech value chain.

The drive for partners has never been more important and is a sign of companies moving toward the next stage as an NVO. But, unlike the previous roadmap to NVO, where a proprietary network of traditional manufacturing partners was maintained, this path is full of even greater challenges with open standards, digitization, and widespread Internet access creating a direct threat to IP loss.

Changing your business model and migrating your organization toward a true NVO requires you to make some hard decisions. You must:

• Determine what is core and what is context to your business.

• Choose your partners carefully and become orchestrator of your own NVO.

• Put measures in place that will protect your most valued asset—intellectual property.

Times are changing. The impact of emerging countries on the high-tech value chain evolution and the subsequent risk of premature commoditization are causing high-tech players to reconsider how they structure their value chain with intellectual property in mind. They must now clearly identify their core, and understand how to manage themselves and all of the players in their value chain.
As companies continue to storm through the battle of IP protection, building a networked virtual organization and integrating this NVO business model helps them focus their strategy, foster growth and innovation, and decrease their risks in the new global environment.

**Call to Action**

After reading this research paper, you might ask yourself the following questions:

- How can I guide my organization through the process of becoming a true NVO and become or stay a leading, profitable, customer-focused company?
- How can I identify my organization’s core and determine which of our processes can best be outsourced?
- How do I maximize and protect my organization’s most valuable asset—our intellectual property?

You need to develop the right business model, pull in the right partners, and create the right value chain that will enable you to deliver innovative products, shorter cycle times, reduced costs, improved quality, and higher performance. A strategy made much easier when you can learn from others who have already been there.

Cisco’s Internet Business Solutions Group (IBSG) is an organization committed to helping customers turn their technology investments into strategic assets that increase productivity, reduce costs, and create new revenue sources. To accomplish this, Cisco IBSG consultants draw upon a decade of technological innovation and industry best practices that have enabled Cisco to gain US$1.94 billion in efficiencies by using Internet capabilities in key aspects of its business in the 2002 fiscal year.

IBSG uses a successful *non-fee-based* business strategy consulting services model and vertical, segment-specific “go to market” strategy that has achieved positive business results for Cisco as well as for its customers. This business consulting and best practice sharing service, which is focused on the top global 500 companies and organizations, might help you and your senior executives answer the questions raised above.

Contact your Cisco account executive or a Cisco partner now to learn how your organization can benefit from an IBSG workshop, which can help you migrate your organization to an NVO strategy.


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**AMBIT MICROSYSTEMS CORPORATION**
Kuang-Lu Lee, Ph.D., President
H.S. Chu, Senior Vice President
Yi-Cheng Wu, Senior Vice President
Ruentien Lu, Special Assistant

**ASML**
Jean-Louis Haneuse, Director, Strategy Development

**FOXCONN**
Fang-Ming Lu, Vice President and General Manager

**HEWLETT-PACKARD**
Pradeep Jotwani, Senior Vice President, Supplies, Imaging and Printing Group
Adrian Koch, Senior Vice President, Personal Systems Group APAC
Michael Hoffmann, Senior Vice President and General Manager, Imaging and Printing Group APAC

**INFINEON TECHNOLOGIES**
Knut Merten, Senior Vice President
Stefan Praschek, Senior Director, Planning and Business Analysis
Jochen Hanebach, Vice President, Center of Excellence

**INTEL CORPORATION**
Daniel R. Russell, Vice President, Sales and Marketing Group

**INVENTEC CORPORATION**
Lin Ruey Shyang, Director, E-Commerce Center
Dr. C.W. Lin, Senior Vice President
Felix Huang, Senior Executive Vice President
C.H. Lee, President
Tim Wang, Senior Manager

**LG ELECTRONICS**
Yoon C. Shim, General Manager, Global Management Group
Shin Moon Sun, Vice President, Global Management Group

**NOKIA**
Juha T. Raisanen, Senior Vice President of Operations, Logistics and Sourcing

**PHILIPS ELECTRONICS**
Johan A van Splunter, Chief Executive Officer, Asia Pacific
Eric H.M. Geelenkirchen, Senior Vice President, HRM Asia Pacific
Andrew D. Crow, CIO, Asia Pacific
R. Kumar, Chairman and CEO, Malaysia

**PHILIPS HEADQUARTERS EMEA**
Ir. W.A. Wielens, Chief Executive Officer

**SAMSUNG ELECTRONICS**
Ki Youl Huh, Executive Vice President and Chief Knowledge Officer
Jong Am Park, Vice President, ERP Group

**STMICROELECTRONICS NV**
Pierre Ollivier, Group Vice President, Legal and I.P.
Bernard Fontan, Group Vice President
Pat Sullivan, Vice President, Communications Business Unit

**VENTURE CORPORATION**
Mark Wettasinghe, General Manager
C.H. Tan, Vice President, EMS